RELATIONSHIP BETWEEN THE ISCHIOTIBIAL AND PARAVERTEBRAL MUSCLES AND LOW BACK PAIN

RELAÇÃO ENTRE OS MÚSCULOS ISQUIOTIBIAIS E PARAVERTEBRAIS COM A LOMBALGIA

RELACIÓN ENTRE LOS MÚSCULOS ISQUIOTIBIALES Y PARAVERTEBRALES CON LA LUMBALGIA

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ABSTRACT

Low back pain or lumbago is a painful condition that affects an increasing number of people around the world and has numerous causal factors. Among these factors, the most distinctive are muscle imbalances, weakness of paravertebral muscles and shortening of ischiotibial muscles. The role of these muscle groups is still controversial and not fully explained in the literature. Thus, a survey was conducted in the SciELO, LILACS, MEDLINE, and PubMed databases in the last decade (2003-2013), using as keywords: hamstrings, low back pain, lumbago, and paravertebral. The works found confirm that, according to the methodology, weakness in paravertebral muscles is of great importance to the development of low back pain as well as the shortening of the ischiotibial muscles, which are directly related to this factor.

Keywords: Low back pain; Back muscles; Paraspinal muscles.

RESUMO

A dor lombar ou lombalgia é um quadro álgico que acomete um número cada vez maior de pessoas em todo o mundo e tem inúmeros fatores causais. Entre esses fatores, os que mais se destacam são desequilíbrios musculares, fraqueza dos paravertebrais e encurtamentos de isquiotibiais. O papel desses grupos musculares ainda é controverso e não está totalmente esclarecido na literatura. Desta maneira, foi realizada uma pesquisa nas bases de dados SciELO, LILACS, MEDLINE e PUBMED na última década (2003 a 2013), utilizando-se como descritores: isquiotibiais, lombalgia, dor lombar e paravertebrais. Os trabalhos encontrados confirmam que, de acordo com a metodologia empregada, a fraqueza dos músculos paravertebrais é de grande relevância para o desenvolvimento das dores lombares, assim como os encurtamentos dos isquiotibiais, que estão diretamente relacionados a esse fator.

Descritores: Dor lombar; Músculos do dorso; Músculos paraespinais.

RESUMEN

El dolor lumbar o lumbago es una condición dolorosa que afecta a un número creciente de personas en todo el mundo y tiene numerosos factores causales. Entre estos factores, los que se destacan son los desequilibrios musculares, debilidad de los músculos paravertebrales y el acortamiento de los músculos isquiotibiales. El papel de estos grupos musculares aún es controvertido y no se explican completamente en la bibliografía. Por lo tanto, se realizó una encuesta en las bases de datos SciELO, LILACS, MEDLINE y PubMed en la última década (2003-2013), utilizando como descriptores: isquiotibiales, dolor de la región lumbar, lumbago y paravertebrales Los trabajos encontrados confirman que, de acuerdo con la metodología empleada, la debilidad de los músculos paravertebrales es de gran importancia para el desarrollo de dolor lumbar, así como el acortamiento de los isquiotibiales, los cuales están directamente relacionados con este factor.

Descriptores: Dolor de la región lumbar; Músculos de la espalda; Músculos paraespinales.

INTRODUCTION

Low back pain or lumbago is a painful condition that mainly affects the lumbosacral region[1,2] between vertebrae L1 and S1. Its multiple causes are related to numerous factors such as physical inactivity, being overweight, muscular weakness, postural changes, muscle shortening, and muscle chain imbalance, among others.[3-7] Among the musculatures that stand out for these causal factors are the ischiotibial and paravertebral antigravitational postural muscle groups. The correlation between the performance of these muscle groups and low back pain is controversial. The objective of this study is to determine whether this correlation exists between the ischiotibial and paravertebral muscles and low back pain, to help elucidate the causal factors and thus improve the treatment of these cases.

Low back pain

Chronic low back pain can be defined as a persistent pain lasting for more than 12 weeks in the lumbar and sacral regions of the spine.[1] Low back pain characteristically affects the region below the last costal arch and above the inferior gluteal folds, and may or may not radiate to the lower limbs.[2] It is known that low back pain can be classified as either primary or secondary. The primary type may or may not include neurological, mechanical-degenerative, non-mechanical, inflammatory, infectious, metabolic, and neoplastic involvement, while secondary

Study conducted at the Universidade Federal de São Paulo, Escola Paulista de Medicina, UNIFESP-EPM, São Paulo, SP, Brazil.
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lumbago is correlated with an association to systemic diseases.[3] Low back pain is caused by multiple factors, but the existence of muscle imbalances in the extensor and flexor muscle chains of the spine are strong indications for the development of chronic low back pain,[4] and there is also an important relationship between the shortening of the ischiotibial and paravertebral muscles and low back pain.[5]

Low back pain is associated with poor trunk and hip flexibility correlated with the paravertebral and ischiotibial muscle groups, which are intimately related to a lack of flexibility.[5] Good flexibility and good muscular balance are necessary to maintain an erect posture and to resist the existing gravitational, external, and intrinsic forces. Currently, it is becoming increasingly difficult to adopt a balanced posture without additional stress to the structures that sustain the spine, mainly as a result of our daily lives where man is exposed to sudden changes of position and/or spends most of his time sitting.[2,6]

In the seated position, there is an increase load of weight in the region of ischial tuberosity region and on the adjacent soft tissue with more pressure in one specific area than in another. This incorrect posture favors the development of shortened ischiotibial and iliopsoas muscles, increasing the chances of a higher degree of lumbar lordosis and stress to the stabilizing structures, as well as the intense contraction of the paravertebral muscles in their attempt to maintain an upright posture, the reduction of flexibility, and a higher load on the intervertebral discs, all of which favor the development of low back pain and pathologies of the vertebral discs.[2-10]

The ischiotibial muscles

The ischiotibials are a group of three muscles: the biceps femoris, the semitendinosus, and the semimembranosus, which are located in the posterior thigh.[10-14] Their origin attachment point is the ischial tuberosity and their insertion point is the posterior face of the condyles of the tibia (hence the name ischiotibials). Their functions are hip extension, knee flexion, and retroversion of the pelvis. This group has an important influence on anterior-posterior pelvic tilt, affecting the mechanics of the lumbar region indirectly.[11-15] In the sitting position, the tendons of the ischiotibials are slack and shorten to correct this slackness, increasing the tension in the ischiotibials and decreasing flexibility. Decreased flexibility of this muscle group can cause postural deviations, such as posterior pelvic tilt, which affects gait and causes pain in the joints and muscles of the lower limbs and, consequently, their misalignment.[11-16]

The paravertebral muscles

The paravertebrals are a group of muscles that consist of the semispinalis, multifidus, rotatores, interspinales, and intertransversarii muscles. They are located in the posterior vertebral spine and their function is the keep the torso upright while we are standing or sitting.[17-22]

There is a close relationship between the paravertebral muscles and low back pain. Studies to evaluate the muscle strength of patients with mechanical low back pain have found severe hypotrophy of the paravertebral musculature of these patients among their results, showing the close relationship between mechanical low back pain and weakness of the paravertebrals.[3,6,23]

This relationship corroborates studies evaluating low back pain in pregnant women, in whom hyperlodotic and biomechanical postural changes during pregnancy affect mainly the ischiotibial, paravertebral, and abdominal muscles.[24,25]

DISCUSSION

The ischiotibials are a group of three muscles located in the posterior region of the thigh, consisting of the semitendinosus, semimembranosus, and biceps femoris.[15,16] Santos et al.[26], in their study of these muscles, found that shortening of the ischiotibials was directly related to pain in the lumbar region. The flexibility of the ischiotibial muscles is important for postural balance and to the maintenance of the total range of motion of the knee and hip.[19,20] Another very important factor is lack of physical activity, directly or indirectly related to back pain due to the shortening of muscles and overloads on the spine, making individuals more susceptible to low back pain.[3,20-24]

Sedentary individuals who had pain in the lumbar region and underwent a program of stretching followed by muscle strengthening experienced an improvement in body posture and a reduction in the incidence of lumbar pain at the end of treatment.[3,23-25] A profile of low back pain is related to the shortening of the ischiotibial muscles.[5] These results were also confirmed in pregnant women, who had decreased low back pain following a program of stretching of the ischiotibials.[26]

Glaner,[27] who conducted a bibliographical review, concluded that stretching exercises are recommended for patients with low back pain, and are beneficial in both injury prevention and pain reduction in patients with chronic low back pain.[24-27]

The primary function of the paravertebral muscles is to create enough torque strength to sustain posture and enable movement, but they also have the critical role of ensuring the stability of the lumbar spine.[28] A study conducted with patients with chronic low back pain found that their extensor muscles were weaker than their flexor muscles.[28] Muscle weakness is associated with lack of physical activity, hypotrophy of the paravertebral muscles,[29,30] and changes in neuromotor control,[31-33] such as delays in anticipatory adjustments of the paravertebral and transverse abdominal muscles, as well as proprioceptive deficits and imbalance.[34]

Postural changes, reduced spinal mobility, obesity, shortening of the ischiotibial muscles in the posterior chain, and weakness of the paravertebral muscles are associated with profiles of chronic low back pain.[32] The flexor and extensor muscles play the important role of protecting the passive structures of the vertebral spine. Hypotrophy resulting from their disuse and from prolonged duration of certain positions, or also from fatigue from repetitive movements, cause the transfer of excessive loads and provoke chronic low back pain.[35,36] The relationship between the action of the flexors and extensors of the spine is very important in movements of muscle strength and resistance for individuals with chronic low back pain.[37]

Studies have been conducted offering evidence that exercises for stabilization of the paravertebral muscles reduce low back pain.[38,39] Trunk strengthening exercises are proven effective for patients with low back pain when results were compared to a control group that did not perform the exercises.[40] Also, strengthening exercises and aerobic exercises promote a quicker return to work in individuals with chronic low back pain.[27] Individuals with lumbar dysfunction demonstrate reduced resistance of the paravertebral musculature, possibly caused by changes in the pattern of motor control and by prolonged overload of the passive support system.[41]

Also, low resistance of the paravertebral muscles to fatigue is common in patients with chronic low back pain.[41,42] These patients avoid movements in their daily life for fear of pain, kicking off a cycle of disuse of this musculature that can evolve into muscle hypotrophy and gradually into a worsening of their profile of progressive low back pain.[43]

FINAL CONSIDERATIONS

Our findings in this review show the important role of two muscle groups (ischiotibial and paravertebral) and the correlation of their dysfunction to low back pain.

As regards the paravertebral muscle group, the weakness of these muscles is related to postural changes, where an imbalance in the muscular chain between the flexor and extensor muscles of the torso is a determining factor for the development of low back pain, showing the importance of the strengthening of this muscular group as a means of treatment and prevention of low back pain.

The ischiotibial muscle group plays a role in the balance between hip and knee movements, in which the shortening of these muscles is closely related to low back pain. In our review, we found that stretching the ischiotibial muscle group helps reduce lumbar pain.

All the authors declare that there are no conflicts of interest regarding this article.

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